

Three New Species of Eolid Nudibranchs from the West Coast of North America

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(28 Text figures)

INTRODUCTION

IN RECENT YEARS many specimens of eolid nudibranchs have been collected along the west coast of North America that have not been previously described in the literature. In many cases, the animals have been sent to me for identification, so that they may be included in checklists, keys, and other pending papers. The present contribution is the first in a series of papers describing these specimens.

I owe a debt of gratitude to Dr. Kikutarô Baba for his many kindnesses over the years in providing me with information and advice. I also wish to thank Gordon A. Robilliard, Gary McDonald, Gale G. Sphon, and Don Cadien for providing specimens and data, and James R. Lance for providing collection data.

EOLIDOIDEA

Pleuroprocta

BABAINIDAE Roller, fam. nov.

Rhachidian tooth cuspidate, no lateral teeth present.

Babaina Roller, gen. nov.

Pleuroproct Eolidoidea with a uniseriate radula (rhachidian tooth cuspidate); denticulated masticatory margins; rhinophores joined together for half their length, clavi bulbous and perfoliate; foot corners very produced; cerata in numerous rows along both sides of the body, not in separate groups; dorso-lateral ridge along entire length of body; penis cylindro-conical, unarmed; anal pore lateral, posterior to pericardium; genital pore lateral, below 3rd to 4th row of anterior liver.

Type species: *Babaina festiva* spec. nov.

The genus is named in honor of Dr. Kikutarô Baba for his more than 40 years of dedicated work with Opisthobranchia and for his many kindnesses to the author.

Babaina festiva Roller, spec. nov.

Type Material: 1) One specimen collected intertidally under rocks at White's Point, Palos Verdes Peninsula, Los Angeles County, California (Long. 118°18'30" W, Lat. 33°43' N) on January 27 1971 by Gale Sphon and Marjorie Neiswanger; 2) two specimens (20 and 22 mm long when alive) collected intertidally at Point Fermin, Los Angeles County, California (Long. 118°17'30" W, Lat. 33°42'30" N) on 14 May 1968 by Don Cadien. The specimen in lot 1 has been designated the holotype, and has been deposited in the California Academy of Sciences Department of Invertebrate Zoology, Type series, no. 486. The radula and jaws of the holotype are mounted separately on CASIZ Type Slide, no. 405. The 22 mm long animal in lot 2 has been designated as a paratype, and has been deposited in the CASIZ Type Series, no. 487. The jaws are mounted separately on CASIZ Type Slide, no. 406. A color transparency of the 20 mm long animal in lot 2 has been deposited in the CASIZ Color Slide Series, no. 2584. Two other specimens have been collected from the La Jolla, California area during 1968 and 1969 (James R. Lance, personal communication). Eight specimens of what appear to be the same species have been collected from a 400 km long area of the west coast of Honshu Island, Japan, from 1956 to 1964 (Dr. Kikutarô Baba, personal communication).

Description: The living animals in lot 2 were 22 and 20 mm long and 3 and 3.5 mm wide, respectively. The 22 mm long animal was 8 mm long after preservation.

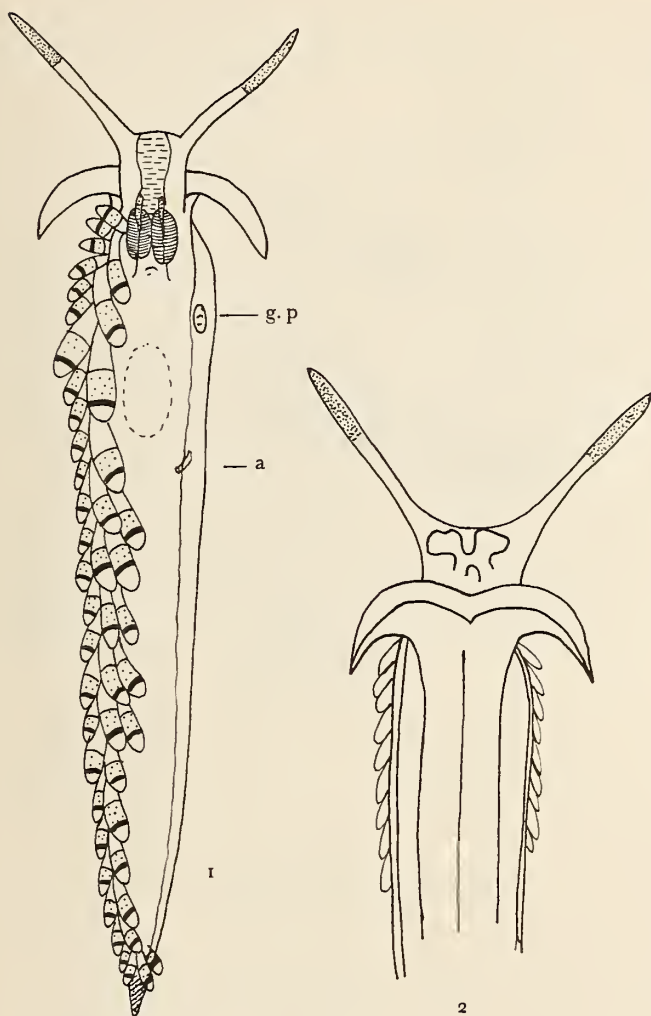


Figure 1

Babaina festiva Roller, gen. nov., spec. nov.

Dorsal view of living animal, 20 mm long

a - anus g. p. - genital pore

dense stippling - yellow light stippling - opaque white
 dashed - yellowish-white solid - cadmium yellow-orange
 diagonal lines - mauve

Figure 2

Antero-ventral view of animal, 20 mm long

length, and by an anterior web of tissue for the middle $\frac{1}{3}$ of their length. From the stalk, the bulbous, laterally compressed clavi branch. Clavi perfoliated with about 35 leaves (Figures 4 and 5). The eyes are contained within the lower $\frac{1}{2}$ of the common stalk (Figure 3). Foot narrow, truncated in front, with anterior corners very produced (3 mm long), and carried backward (Figure 2). Tail short, bluntly pointed posteriorly, barely showing behind last cerata when animal is crawling.

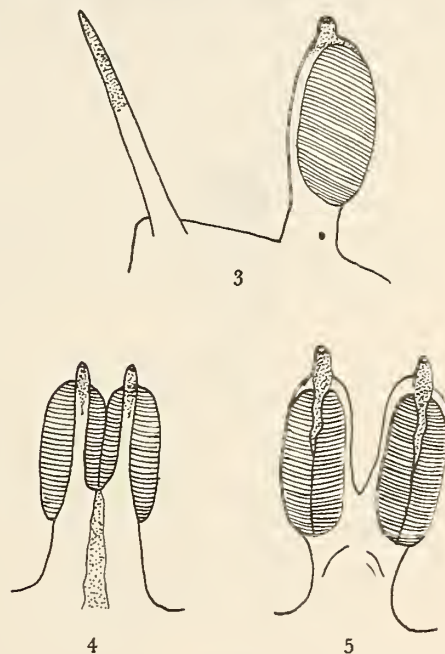


Figure 3

Babaina festiva Roller, gen. nov., spec. nov.

Side view of head showing oral tentacles and rhinophores

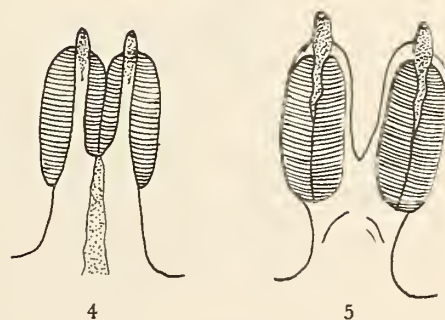


Figure 4

Front view of rhinophores

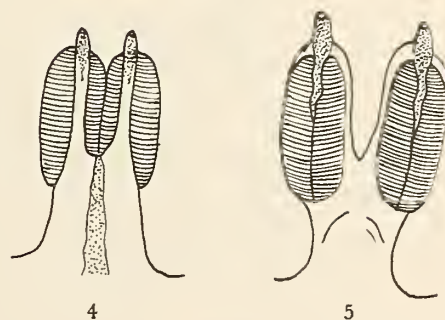


Figure 5

Rear view of rhinophores

Body color pinkish-red in head region and along sides of foot, lighter pink around cardiac elevation. Proximal $\frac{1}{2}$ of oral tentacles same color as head, distal $\frac{1}{2}$ light yellow. A line of yellowish-white pigment runs along median line of head from base of rhinophores to a point at front of head between oral tentacles. The rhinophore bases are light pink and the perfoliated portion is brown with a light pink stripe running up the anterior edge for the proximal $\frac{1}{2}$, to be overlaid with an encrustation of dots of

The holotype was 11 mm long after preservation, live length unknown. Body long and narrow. Head prominent with 4 mm long simple oral tentacles carried forward and diverging distally (Figure 1). The rhinophores are joined by a common stalk for the proximal $\frac{1}{3}$ of their

yellow pigment in the distal half. The yellow pigment is scattered over the top of the rhinophores (which end in a knob surmounted by a brown tip) and continues as a stripe down the posterior edge of the clavi for about $\frac{1}{2}$ of their length (Figures 4 and 5). The pericardial area is covered with opaque white spots, and the dorsal surface of the tail with light mauve interspersed with opaque white spots. The cerata lumina are pinkish-red for the proximal $\frac{1}{2}$, followed by a wide band of opaque white, then a narrow band of cadmium yellow-orange, with the tip translucent greyish. The ceratal cores are darker pinkish-red (Figure 6).



Figure 6

Babaina festiva Roller, gen. nov., spec. nov.

Individual ceras

dense stippling - opaque white light stippling - light pink
solid - cadmium yellow-orange

The fusiform cerata are carried folded downward and backward, and cover the dorsum except in the area of the pericardium and the tip of the tail. They are set in about 22 oblique rows of 2 to 3 cerata each, starting just anterior to the rhinophores. The cerata do not appear to be in separate groups when viewed from above. The lateralmost cerata in each row are on an obvious dorso-lateral ridge that runs the length of the body. The anal pore is ventral to the dorso-lateral ridge, just posterior to the pericardium (Figure 1).

The yellowish buccal mass was 0.7 mm wide and 1 mm long. The delicate jaws have a long masticatory process, denticulated for its entire length with several rows of long, pointed denticles (Figures 7 and 8). The yellowish radula was tapered, and contained 16 rows, with one more forming. There were no lateral teeth. The central tooth is broadly arched with the cusp projecting beyond the 6 to 10 lateral denticles on each side (Figure 9).

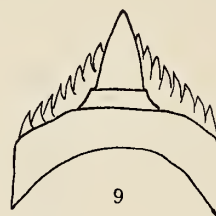
The genital pore is ventral to the dorso-lateral ridge, just below the fourth row of cerata in the anterior liver (Figure 1). The everted penis is long (2 mm) and cylindrical, tapering to a conical tip with no stylet visible.



7



8



9

Figure 7

Babaina festiva Roller, gen. nov., spec. nov.

Jaw - interior view

Figure 8

Enlarged view of masticatory process

Figure 9

Radular tooth, fifth from newest in ribbon

Discussion: This new family most closely resembles the family Flabellinidae (enlarged to include the Coryphellidae by MARCUS & MARCUS, 1967) in the pleuroproct anus, the dorso-lateral ridge, and the jaw with several rows of denticles. However, members of the family Flabellinidae, as presently described, exhibit lateral radular teeth; but the characters of the family might be expanded to include animals with uniserial radulae. I believe that a new family should be erected on the basis of this unique character. The only other fully recognized family of the Pleuroproeta is Pleurolidiidae BURN (1966, p. 22) in which the most important character used to create the family was a radular one, a pectinate rhaehidian tooth. Whether the common-stalked rhinophores constitute a specific, generic, or familial character remains to be seen.

ACLEIOPROCTA

EUBRANCHIDAE

Eubbranchus sanjuanensis Roller, spec. nov.

Type Material: Five specimens collected subtidally on the hydroid *Sertularella tricuspidata* at Friday Harbor, San Juan Island, Washington (Long. 123°00' W, Lat. 48°32' N) on 18 August 1969 by Gordon A. Robilliard. The holotype has been deposited in the CASIZ Type Series, no. 488. A designated paratype has been deposited in the same institution as CASIZ Type Series, no. 489. A color transparency of the holotype has been deposited in the CASIZ Color Slide Series, no. 2583.

Description: The living animals were between 5.5 and 6 mm long, 2.5 mm wide with simple oral tentacles 1 mm long and simple rhinophores 1.5 mm long. Oral tentacles, rhinophores, and body color translucent greyish. Yellowish-brown jaws show through the body wall, the eyes

visible just above and behind them. Foot truncated anteriorly with rounded foot corners (Figure 11). Posterior of foot bluntly pointed, not showing behind posteriormost cerata when animal is crawling. Opaque white ovo-testes show through the posterior portion of the back. Lumen of the cerata transparent greyish with the knobby liver ducts showing through as reddish-orange. Cnidosac region obscured by a band of dense white spots; but the tip is clear (Figure 12).

There are 7 rows of inflated fusiform cerata with 3 rows in the anterior liver. There are 2, 4, 4, 3, 3, 3, 2 cerata per row on the left and 3, 5, 4, 4, 3, 3, 3 on the right. Largest cerata (2 mm long) are found toward the median line, those at the margin are smaller (0.5 mm long). Anal pore just anterior to the innermost ceras of the 4th row, and to the right of pericardial elevation (Figure 10). Surface of the cerata rugose, but not tuberculate.

Yellowish-brown jaws narrow and pointed posteriorly, with one row of 12 small denticles on masticatory margin (Figures 14 and 15). Radula is "J" shaped with 24 teeth

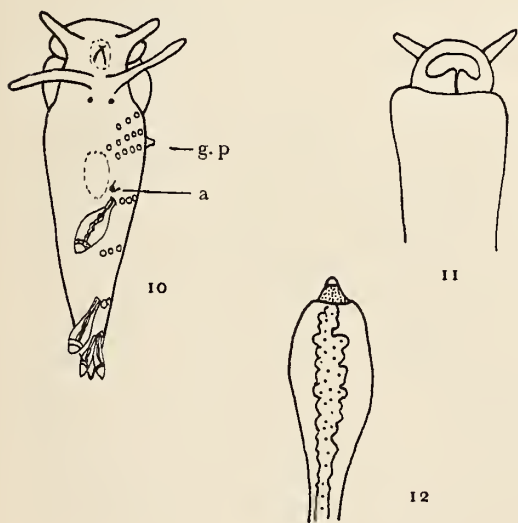


Figure 10

Eubbranchus sanjuanensis Roller, spec. nov.
Dorsal view of living animal, 6 mm long
a - anus g. p. - genital pore

Figure 11

Antero-ventral view of animal, 6 mm long

Figure 12

Individual ceras

dense stippling - opaque white light stippling - reddish-orange

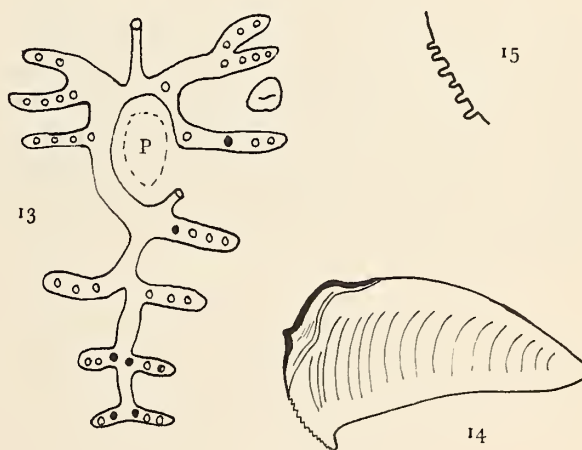


Figure 13

Eubbranchus sanjuanensis Roller, spec. nov.
Ceratal distribution - solid circles represent position of longest cerata

Figure 14

Jaw - exterior view

Figure 15

Enlarged view of masticatory process

in the older limb and 26 teeth in the newer (Figure 16). Radular formula is $50 \times 1 \cdot 1 \cdot 1$. Central cusp projects beyond the 2 or 3 large lateral denticles, and the lateral plates are broader than rhachidian tooth (Figure 17).

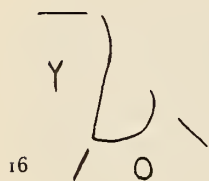


Figure 16

Eubranchus sanjuanensis Roller, spec. nov.

Radular ribbon — O — oldest limb; Y — youngest limb

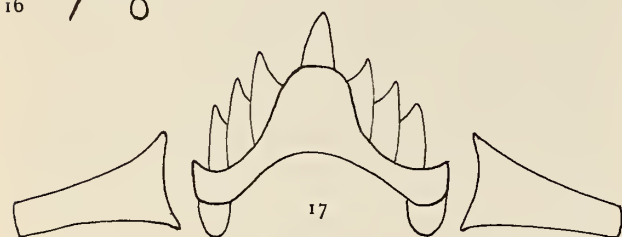


Figure 17

One row of radular teeth

The male reproductive system was examined by dissection of a 5.5 mm long animal. Gonopore ventral to the 2nd and 3rd rows of cerata on the right side. The penis is conical and armed with a 12.5 μ stylet that is 2.5 μ in diameter at its tip. Distal portion of the vas deferens prostatic, proximal part narrow and muscular. A long penial gland is present (Figure 18).

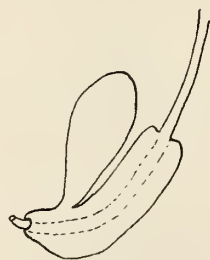


Figure 18

Eubranchus sanjuanensis Roller, spec. nov.
Male reproductive system

Discussion: Of the species presently allocated to *Eubranchus* by EDMUNDS & KRESS (1969), 3 are recorded from the west coast of North America: *E. occidentalis* MacFarland, 1966; *E. olivaceus* (O'Donoghue, 1922); and *E. rustyus* (Marcus, 1961). None of these exhibit the orange-red coloration of *E. sanjuanensis*. Other differences in radular shape, ceratal arrangement, or reproductive system separate it from the above 3 species; and from *E.*

rubeolus Burn, 1964 and *E. inabai* Baba, 1964, both described as having red ceratal cores.

CLEIOPROCTA

FACELINIDAE

Emarcusia Roller, gen. nov.

Eolidoidea with anus in the cleioproct position; rhinophores smooth; foot corners very produced; radula uniseriate, central cusp projecting beyond the lateral denticles; masticatory margin with 2 rows of denticles in "V" shape; penis armed with a tubular stylet, and with maneuverable accessory male organ; anterior liver branches in form of rows, posterior liver in arches.

Type species: *Emarcusia morroensis* spec. nov.

The genus is named in honor of the late Dr. Ernst Marcus, in appreciation of his many years of devoted service to the field of zoological research, and especially in the area of opisthobranchs.

Emarcusia morroensis Roller, spec. nov.

Type Material: 1) Two specimens collected from hydroids on boat landings at Morro Bay, San Luis Obispo County, California (Long. 120°51' W, Lat. 35°22' N) on 28 September 1969 by Gary McDonald; 2) 20 specimens collected from hydroids on boat landings at Morro Bay, California between 15 November 1969 and 3 December 1969 by the author. The holotype has been deposited in the CASIZ Type Series, no. 490. A color transparency of the holotype has been deposited in the CASIZ Color Slide Series, no. 2585. Three specimens, designated as paratypes, have been deposited in the CASIZ Type Series, nos. 491, 492, and 493. Three specimens, also designated as paratypes, are deposited in the Los Angeles County Museum of Natural History Invertebrate Zoology Type Collection, no. 1615.

Description: Living animals were between 3.5 and 16 mm long, the holotype 14 mm long. Body slender (2 mm wide) and long; foot slightly wider (2.5 mm) than the body, anterior end wider than the rest of foot. Foot corners grooved anteriorly, very produced (2.5 mm long), and carried backward when animal is crawling (Figure 19). Front of foot truncated, bilabiate. Upper lip slightly notched, mouth a longitudinal slit (Figure 20). Rhinophores simple, carried upright, and diverging distally, 3.5 mm long. Eyes directly beneath rhinophore bases. Oral

tentacles simple, 4.5 mm long. Posterior end of foot narrow, pointed; extending 4 mm beyond last cerata when animal is crawling.

Body color translucent greyish, with two light cadmium orange oval spots (composed of scattered dots) on the median line; one spot anterior to and one posterior to

rhinophoral insertion. In some animals a thin line of the same orange color connects the two spots along the median line (Figure 19). A narrow line of light orange runs along each side of head from anteriormost cerata to posterior point of insertion of oral tentacles, and continues along posterior margin of oral tentacles for proximal $\frac{2}{3}$ of their length. Light orange color also present on proximal $\frac{2}{3}$ of rhinophores, in groove between head and foot, and covering pericardium. Distal $\frac{1}{3}$ of oral tentacles and rhinophores with scattered opaque white dots forming light cap. Scattered heavy opaque white spots along median line of head continuing through inter-rhinophoral space to posterior portion of pericardial area. Starting beneath the pericardium and extending posteriorly, an irregular line (of varying width and ragged edges) runs along median area of back to posteriormost cerata row. Narrow lines of opaque white color branch off from this median line to each ceratal group. Cerata lumen translucent greyish, the knobby ceratal cores light ochre with scattered dark brownish-black spots, often concentrated in 3 circular bands. Distal band darker black, and most noticeable in living animals. Concentrated band of reddish-brown pigment often located at attachment of cerata to back. Cnidosomes deep white. Surface of ceratal cores dotted with opaque white spots overlaying ochre color (Figure 21).

Cerata arranged in 4 to 5 rows in the anterior liver and 3 to 4 arches in the posterior liver. Posteriormost cerata not distributed in any particular pattern. Cerata carried folded toward the median line and posteriorly; very little of back shows when animal is crawling. The holotype had the following ceratal distribution: 2, 4, 4, 5, 10, 7, 6, 3, 1, 1 on the left and 3, 3, 5, 6, 10, 8, 6, 2, 2, 1 on the right. Anterior cerata groups are on slightly raised bosses. Longest cerata are located toward the median line, with many very small regenerating cerata at lateral margins. Anal pore located on a low papilla, between arms of first arch of posterior liver (Figure 19).

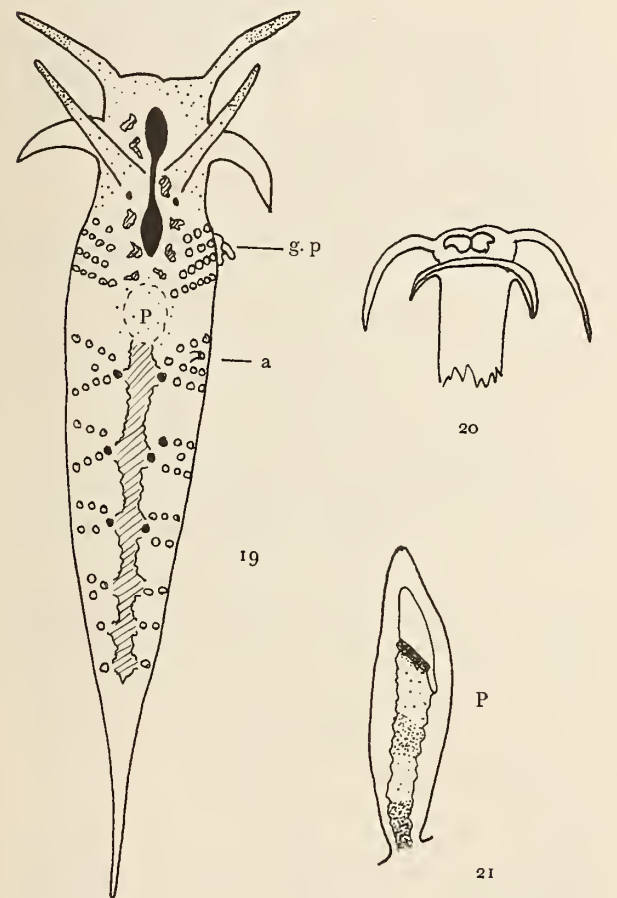


Figure 19

Emarcusia morroensis Roller, gen. nov., spec. nov.

Dorsal view of living animal, 14 mm long

(showing ceratal distribution - solid circles represent longest cerata)

a - anus g. p. - genital pore

dense stippling - yellow

light stippling - light orange

solid - cadmium orange

dashed - opaque white

Figure 20

Antero-ventral view of animal, 14 mm long

Figure 21

Individual ceras
dense stippling - brownish-black

P - posterior edge
light stippling - ochre



Figure 22

Emarcusia morroensis Roller, gen. nov., spec. nov.

Jaw - exterior view

Figure 23

Enlarged view of masticatory process

The yellowish-brown jaws broad, with a very slight indentation in dorsal edge (Figure 22). The long masticatory process with 2 rows of denticles arranged in a "V" shape, with the apex pointing toward the end of process. The interior row has 23 short denticles, the exterior row about 13 very small denticles (Figure 23). Radular formula: $15 - 22 \times 0 \cdot 1 \cdot 0$ in 7 specimens observed. Radular plates arched, with central cusp projecting for $\frac{1}{2}$ its length beyond the 7 to 10 long, narrow denticles on each side (Figure 24).

The reproductive system was examined by dissection. Spermooviduct divides soon after leaving the ampulla, and a duct from the spermatheca enters at this division point. The oviduct, after a very short distance, enters the female gland mass. Vas deferens narrow and muscular, but soon

slender opaque white string (0.3 mm wide) coiled dextrally to form a 2.75 mm wide mass. Swimming larvae were noted 5 days after spawn was laid.

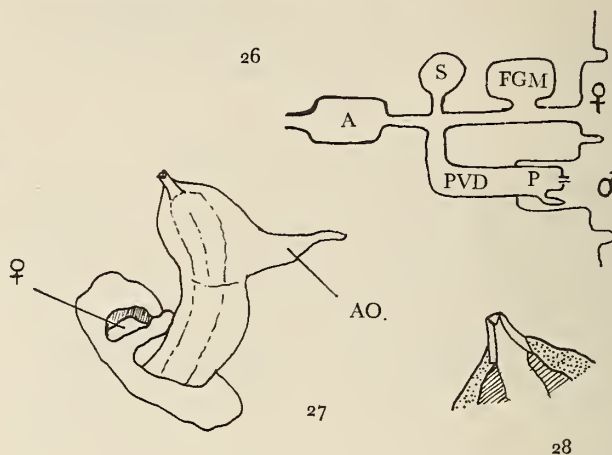


Figure 26

Emarcusia morroensis Roller, gen. nov., spec. nov.

Diagrammatic view of reproductive system

A - ampulla S - spermatheca FGM - female gland mass
PVD - prostatic portion of vas deferens P - penis

Figure 27

Genital pore with penis everted; drawn from living animal during copulation
AO - male accessory organ

Figure 28

Enlarged view of penial stylet

dense stippling - penis diagonal lines - vas deferens

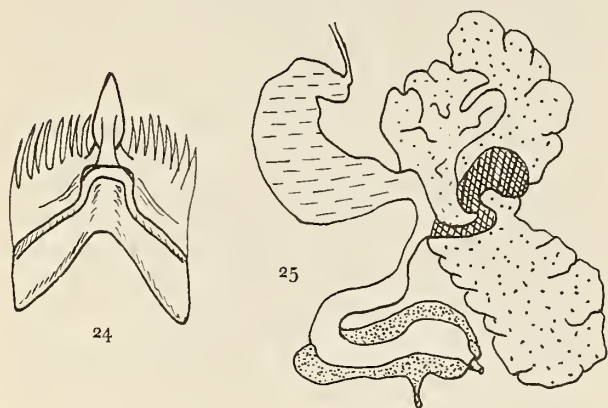


Figure 24

Emarcusia morroensis Roller, gen. nov., spec. nov.
Radular tooth, ventral view

Figure 25

Portion of reproductive system

dense stippling - penis light stippling - female gland mass
cross-hatching - spermatheca dashed - ampulla

widens and becomes prostatic (Figures 25 and 26). Penis conical and tipped with a short, straight stylet. The vas deferens leads through the penis to base of the stylet (Figure 28). Connected to side of the glans is a long conical accessory organ that is elongated and contracted violently during copulation (Figure 27). In a cleared specimen, this organ did not appear to be distinct from the glans, and no connection to the vas deferens was observed. When retracted, penis is coiled in body area under the jaw. Gonopore located ventral to the 2nd and 3rd rows of the right anterior liver, and is divided into male and female openings by a flap of tissue (Figure 27). Spawn a

Discussion: The family Facelinidae has been expanded by EDMUNDS (1970) to include the genera previously allocated to the Favorinidae. This makes the number of genera in the family very large. Since new taxa are being described, including the present one, that do not fit into the older groups, the family will doubtless grow until reliable separating characters are found. The animals in this family seem to have an endless variety of male organs and copulatory accessories, such as the fantastic apparatus of the newly described genus *Pruvotfolia* Tardy, 1969. Perhaps when the use of these structures is more fully understood, they may constitute a character suitable for diagnostic purposes.

ADDENDUM

Since writing the manuscript for this article, several additional collections of material have been made which

extend the ranges and reinforce the validity of 2 of the newly described species.

Babaina festiva: One 17 mm long specimen collected by Shane Anderson during October 1971 from kelp hold-fasts at 4.5 m depth at Paradise Cove, Malibu Reef, Los Angeles County, California.

One 28 mm long specimen collected by Shane Anderson during October 1971 from the Malibu Reef area.

Emarcusia morroensis: One specimen collected by James R. Lance from ropes on Dana Landing Boat Docks, Mission Bay, San Diego, California, on 6 July 1969.

One 10 mm long specimen and its spawn collected by Gary McDonald on a mussel shell from tires at Texaco Dock, Morro Bay, San Luis Obispo County, California, on 17 October 1971.

Six specimens collected by Gary McDonald from short hydroids on tires at Skipper's Docks, Elkhorn Slough, Monterey County, California on 17 November 1971.

Two specimens (7.5 and 8 mm long) collected by R. A. Roller from short hydroids on tires at Virg's Dock, Morro Bay, on 22 November 1971. Both of these specimens were later observed to spawn in captivity.

These collection records extend the ranges of these 2 species to the following:

Babaina festiva – Malibu Reef to La Jolla, California; Japan.

Emarcusia morroensis – Elkhorn Slough to San Diego, California.

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